



Forage

Introduction

Forage - grass and maize silage - is an important constituent of animal feeds. Knowing all the major components and characteristics offers distinct advantages to optimise feeding regimes but analysis by wet chemistry techniques are time consuming and costly. NIR analysers have replaced most of the traditional methods to provide rapid multi-component analysis. These analysers can run a large amount of samples in a short time, either manually or automated. The analysis time per sample is less than one minute.

The Analyser

The AgriQuant FT-NIR analyser system is a revolution in FT-NIR technology and user friendliness. Designed around new FT-NIR

interferometer technology the AgriQuant requires preventative maintenance at only 5 year intervals (source replacement), has a small footprint, no hygroscopic optics, incorporates a modular design allowing rapid detector changes and allows the development of unique sample handling accessories.



Figure 1: The AgriQuant FT-NIR

Calibration Modelling

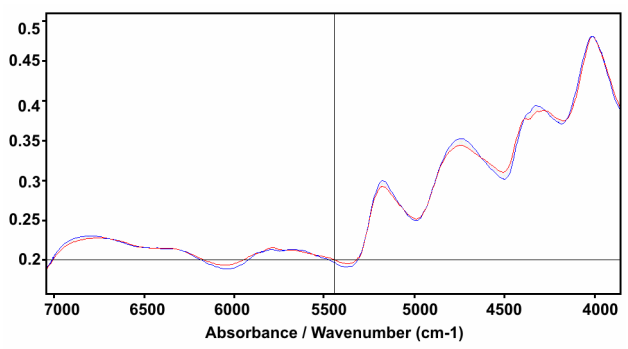


Figure 2: Typical FT-NIR spectra of dried grass or maize

The Quant is calibrated against certified methods for the different components. The NIR region contains both combination and overtone information. The most sensitive bands are those derived from the O-H, N-H and C-H stretch regions. Different pre-processing has been used for the different components, typically mean centring and manual base line correction or 2nd derivative (Savitsky- Golay). A Partial Least Squares (PLS) model was developed based on the analytical and spectral data.

Calibration Performances

60 samples of dried maize and 70 samples of dried grass were used for modelling. The material was ground and placed in glass bottles. Table 1 shows the performance of the calibrations developed for all the components with chemical reference analysis available. Repeatability tests used a sample of grass measured 5 times.

Grass	Range %	NIR SECV	Repeatability
Protein	6-27	0.69	0.07
Fibre	17-38	0.89	0.08
In Vitro	52-84	1.84	0.54
Sugar	0.2-18.3	0.90	0.12
NDF	29-68	1.54	0.12
ADF	21-40	1.12	0.16
pH	4-5.4	0.094	0.022
Lactic Acid	1.2-13.8	0.62	0.072
Acetic Acid	0.9-3.5	0.27	0.078
Ammonium No.	0.06-0.3	0.030	0.003

Maize	Range %	NIR SECV	Repeatability
Protein	6-10	0.37	0.08
Fibre	14-34	0.73	0.07
In Vitro	62-80	1.52	0.48
Starch	1-38	1.28	0.11
NDF	30-64	1.38	0.16
ADF	18-31	0.76	0.15
pH	3.7-4.1	0.072	0.018
Lactic Acid	2.7-7.2	0.43	0.064
Acetic Acid	1-4.4	0.26	0.077
Ammonium No.	0-0.11	0.008	0.003

Conclusion

The AgriQuant is an analyser designed for analysing forage and feed. The bottle rotates during analysis so a large amount of the sample is scanned, leading to more reliable and stable results. The analysis is complete in less than one minute on multiple components. This eliminates individual analysis for each constituent and saves on manpower, training, time and consumables. The analysis can be automated using transport belt, barcode reader or radio frequency tagging.